

Section 83 — The FUNt Entanglement Conservation Law (ECL-L)

Section 83 introduces ECL-L, the Entanglement Conservation Law. This is one of the high-order FUNt laws governing how entanglement is preserved, redistributed, or phase-shifted across scales. Entanglement in FUNt is not a fragile binary connection — it is a φ -scaled coherence bond that persists through collapse, decoherence, tunneling, biological turnover, and cosmic cycling. ECL-L formalizes the rule that entanglement cannot be destroyed; it can only change harmonic form.

83.1 Entanglement Is a ϕ -Structured Coherence Bond

- Entanglement is not a cable or link; it is a φ -ratio alignment.
- The bond persists independently of distance, motion, or medium.
- Disruption of geometry does not disrupt entanglement.
- Strength of bond is proportional to $\varphi^D \cdot C$ (coherence).

83.2 The Entanglement Conservation Equation

FUNt defines conserved entanglement ε via:

$$\varepsilon = \varphi^D \cdot (C_1 C_2 / \kappa_{12})$$

Where:

- ε = conserved entanglement amplitude
- φ^D = fractaile scaling exponent
- C_1, C_2 = coherence states of partner systems
- κ_{12} = curvature load between them

ε stays constant even if C_1 , C_2 , or κ_{12} change individually — only redistribution occurs.

83.3 Entanglement Redistribution, Not Loss

- Entanglement cannot be broken; it can redistribute to deeper or shallower φ -layers.
- Decoherence hides entanglement temporarily but does not erase it.
- Partner systems retain τ_0 -identity anchoring from Section 82.
- Loss of signal $\neq$ loss of entanglement (only depth shift).

83.4 Proton–Electron Entanglement

- Hydrogen's stability arises from conserved entanglement εH .
- During tunneling, εH remains constant while orbital geometry shifts.

- Ionization reduces curvature κ_{12} but ϵH remains stored in φ -state memory.

83.5 Multi-Body Entanglement and Lattice States

- Crystalline structures exhibit shared entanglement reservoirs.
- Lattice strain stores curvature; entanglement reorganizes to maintain ϵ .
- Superconductors achieve perfect entanglement-phase lock ($\epsilon = \max$).

83.6 Biological Entanglement Conservation

- Cells inherit entanglement from prior generations as structural φ -memory.
- Organ coherence arises from cross-cell entanglement reservoirs.
- Trauma redistributes entanglement depth, requiring φ -recovery.

83.7 Neural Entanglement

- Neural ensembles remain entangled even when firing synchrony collapses.
- Learning strengthens ϵ by boosting coherence terms.
- Memory is an entanglement-anchored reconstruction, not stored data.

83.8 Planetary & Atmospheric Entanglement

- Weather cells exhibit large-scale entanglement exchange.
- Jet streams conserve ϵ even when undergoing phase-slip (Sec. 81).
- Climate mode persistence reflects entanglement memory across cycles.

83.9 Cosmic Entanglement Conservation

- Cosmic filaments remain entangled across Gyr timescales.
- WWR cycles compress entanglement but do not erase ϵ .
- CMB anisotropies are residual entanglement fossils.

83.10 Unified Statement of ECL-L

The Entanglement Conservation Law states that entanglement is a φ -structured coherence invariant that cannot be destroyed. Geometry may change, curvature may rise or fall, coherence may deepen or shallow — but ϵ remains constant. All systems retain entanglement memory through harmonic scaling, from protons to biological networks to galaxies.